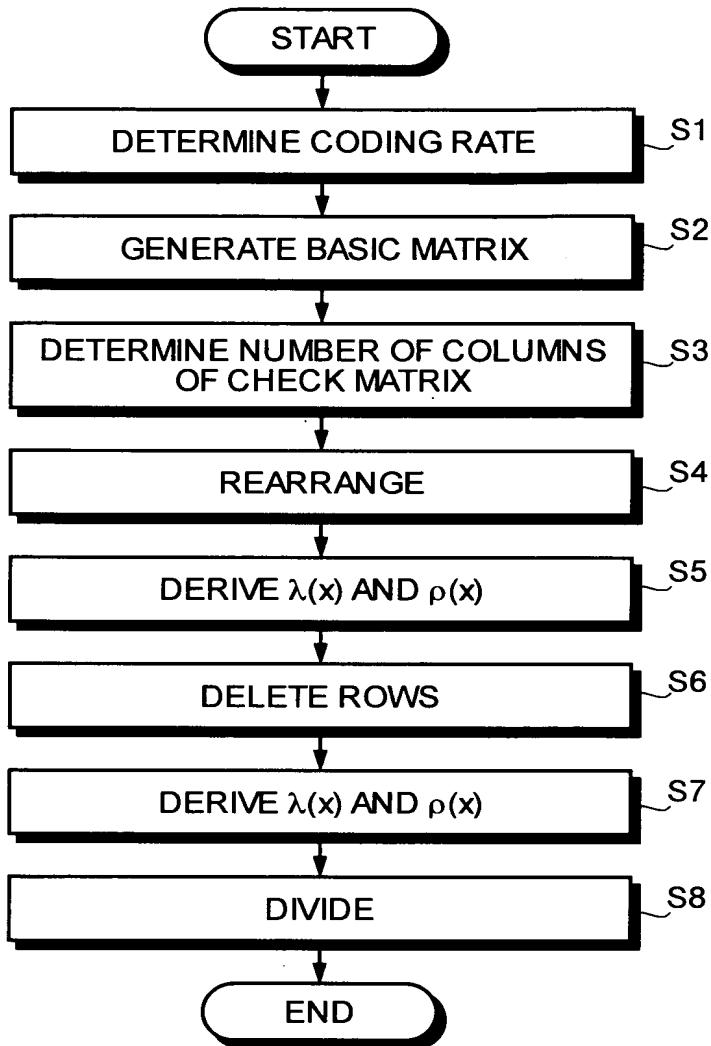


FIG.1



2/10

FIG.2

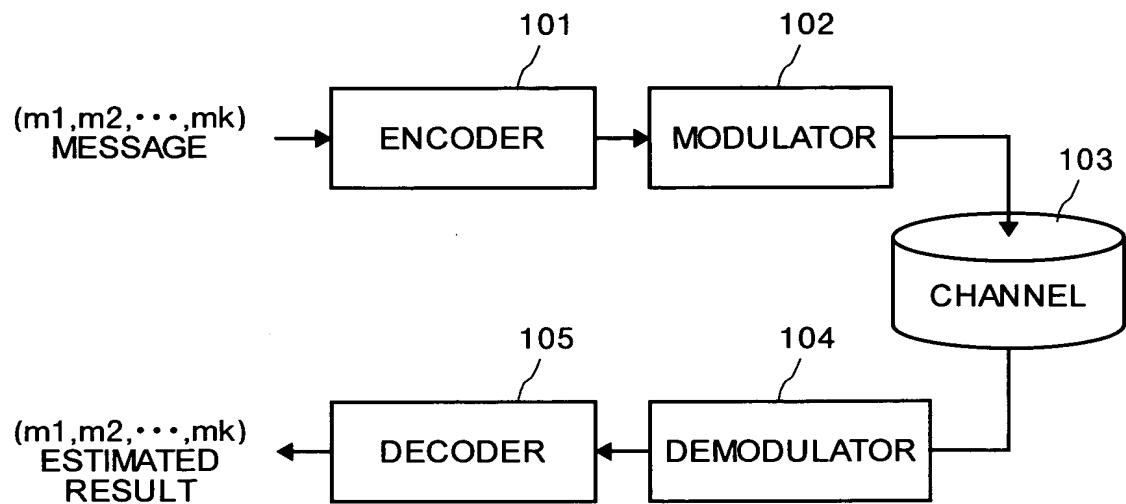


FIG.3

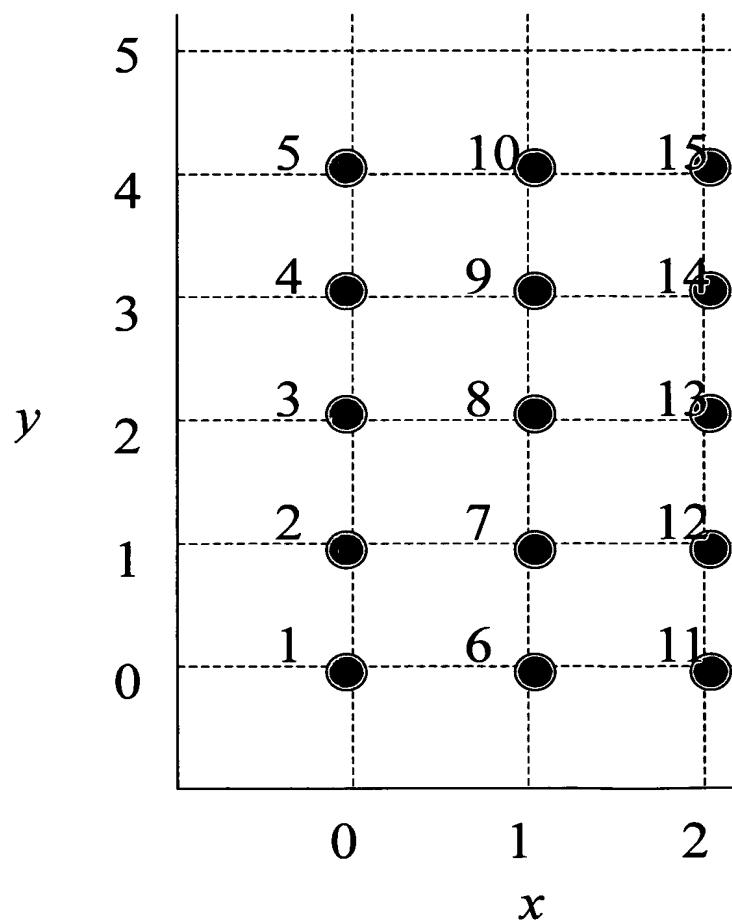


FIG.4

	$s=0$	$s=1$	$s=2$	$s=3$	$s=4$
CLASS	{1,6,11}	{1,7,13}	{1,8,15}	{1,9,12}	{1,10,14}
	{2,7,12}	{2,8,14}	{2,9,11}	{2,10,13}	{2,6,15}
	{3,8,13}	{3,9,15}	{3,10,12}	{3,6,14}	{3,7,11}
BLOCK	{4,9,14}	{4,10,11}	{4,6,13}	{4,7,15}	{4,8,12}
	{5,10,15}	{5,6,12}	{5,7,14}	{5,8,11}	{5,9,13}

FIG.5

```

 $s=0, S=\{s\}, B=B(s), S'=\{1,2,\dots,m-1\}.$ 
While  $S \neq \text{empty set}$ 
   $s=s+1$ 
    if  $g(V, B' \cup B(s))=8$ 
       $S=S \cup \{s\}$ 
       $S'=S' \setminus \{s\}$ 
       $B'=B' \cup B(s)$ 
    else
       $S'=S' \setminus \{s\}$ 
    end
  end

```

FIG.6

k	m	S	$N= B $	$M= V $	(dv, dc)
3	5	0,1	10	15	(3,2)

FIG.7

$$\begin{array}{l}
 p_1 \begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \end{pmatrix} \\
 p_2 \begin{pmatrix} 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \end{pmatrix} \\
 p_3 \begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \end{pmatrix} \\
 p_4 \begin{pmatrix} 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 \end{pmatrix} \\
 p_5 \begin{pmatrix} 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 \end{pmatrix} \\
 p_6 \begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{pmatrix} \\
 p_7 \begin{pmatrix} 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \end{pmatrix} \\
 p_8 \begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \end{pmatrix} \\
 p_9 \begin{pmatrix} 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 \end{pmatrix} \\
 p_{10} \begin{pmatrix} 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 \end{pmatrix} \\
 p_{11} \begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \end{pmatrix} \\
 p_{12} \begin{pmatrix} 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{pmatrix} \\
 p_{13} \begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \end{pmatrix} \\
 p_{14} \begin{pmatrix} 0 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 0 \end{pmatrix} \\
 p_{15} \begin{pmatrix} 0 & 0 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 \end{pmatrix}
 \end{array}$$

FIG.8

k	m	S	$N= B $	$M= V $	(dv,dc)
10	353	0,1,10,11,23,24,224	2471	3530	(10,7)

FIG.9

```

for  $i = 1$  to  $|V|$ 
   $R_{k*((i-1) \bmod m) + \lfloor (i-1)/m \rfloor + 1} = R_i$ 
end

```

5/10

FIG.10

$$\begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \end{pmatrix}$$

FIG.11

Rate	0.5		
	x	λx	No.
2		0.28647619	3008
3		0.264571429	1852
4		0.001142857	6
6		0.138285714	484
10		0.30952381	650
	x	ρx	No.
7		1	3000
σ_{GA}			0.940358043

10/520061

6/10

FIG.12

10/520061

7/10

FIG. 13

G0	2	j	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
C(1)	1	LB(1)	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
C(2)	2	LB(2)	2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 14 17 1 3 5 7 9 11 13 15 17 19 21 23 25 27
C(3)	3	LB(3)	3 6 9 12 15 18 21 24 27 30 7 11 2 5 8 11 31 16 20 23 26 29 32 22 1 4 7 10 13 16 19 22
C(4)	4	LB(4)	4 8 12 16 20 24 28 32 8 3 18 23 15 19 23 27 11 15 2 6 10 14 18 9 26 30 24 1 5 9 13 17
C(5)	5	LB(5)	5 10 15 20 25 30 5 3 17 13 29 10 28 10 1 6 28 14 21 26 31 21 4 20 14 19 14 29 26 2 7 12
C(6)	6	LB(6)	6 12 18 24 30 5 12 11 26 23 3 22 4 24 16 22 8 32 3 9 15 6 27 7 2 8 4 20 18 32 1 7
C(7)	7	LB(7)	7 14 21 28 3 11 19 19 7 6 14 9 17 1 31 1 25 13 22 29 20 28 13 31 27 23 31 11 10 25 32 2
C(8)	8	LB(8)	8 16 24 32 8 17 26 27 16 16 25 21 30 15 9 17 5 31 4 12 4 13 22 18 15 12 21 2 2 18 26 28
C(9)	9	LB(9)	9 18 27 3 13 23 3 6 25 26 10 8 6 29 24 12 22 12 23 32 25 20 8 5 3 1 11 30 31 11 20 24
C(10)	10	LB(10)	10 20 30 7 18 29 10 14 6 9 21 20 19 6 2 28 2 30 5 15 9 5 31 29 28 27 1 21 23 4 14 19
C(11)	11	LB(11)	11 22 2 11 23 4 17 22 15 19 32 32 20 17 7 19 11 24 18 30 27 17 16 16 16 28 12 15 27 8 14
C(12)	12	LB(12)	12 24 5 15 28 10 24 30 24 29 6 7 8 11 32 23 16 29 6 1 14 12 3 3 4 5 18 3 7 20 2 9
C(13)	13	LB(13)	13 26 8 19 1 16 31 1 5 2 17 19 21 25 10 2 13 10 25 21 19 19 26 27 29 31 8 31 28 13 27 4
C(14)	14	LB(14)	14 28 11 23 6 22 1 9 14 12 28 31 10 2 25 18 30 28 7 4 3 4 12 14 17 20 25 22 20 6 21 31
C(15)	15	LB(15)	15 30 14 27 11 28 8 17 23 22 2 6 23 16 3 13 10 9 26 24 26 21 1 5 9 15 13 12 29 15 26
C(16)	9	LB(16)	16 32 17 31 16 3 15 25 32 32 13 18 12 30 18 29 27 8 7 8 11 7 25 30 24 5 4 4 22 9 21
C(17)	18	LB(17)	17 1 20 2 21 9 22 4 4 5 24 30 25 7 11 8 7 8 27 27 29 18 30 12 18 13 32 32 25 15 3 16
C(18)	18	LB(18)	18 3 23 6 26 15 29 12 13 15 9 5 1 21 26 24 26 9 10 13 3 16 23 6 2 22 23 17 8 28 11
C(19)	19	LB(19)	19 5 26 10 31 21 6 20 22 25 20 17 14 12 4 3 4 7 28 30 18 25 2 10 31 28 12 14 9 1 22 6
C(20)	5	LB(20)	20 7 28 14 4 27 13 28 31 8 31 29 27 26 19 19 21 25 10 13 2 10 25 21 19 17 2 5 1 31 16 1
C(21)	10	LB(21)	21 9 32 18 9 2 20 7 3 18 5 4 3 3 12 14 1 6 29 16 23 32 11 8 7 6 29 24 30 24 10 28
C(22)	20	LB(22)	22 1 22 14 8 27 15 12 28 16 16 17 27 30 18 24 11 19 7 17 20 32 32 19 15 22 17 4 23
C(23)	3	LB(23)	23 13 4 26 19 14 4 23 21 1 27 28 31 5 9 15 5 30 2 28 2 6 19 20 21 9 6 14 10 29 18
C(24)	6	LB(24)	24 15 7 30 24 20 11 31 30 1 3 5 8 20 25 32 23 12 22 12 24 29 6 8 10 26 25 6 3 23 13
C(25)	12	LB(25)	25 17 10 1 29 26 18 2 21 12 15 18 22 13 4 12 4 31 5 17 9 15 30 21 25 16 16 27 26 17 8
C(26)	24	LB(26)	26 19 13 5 2 32 10 11 31 23 27 31 13 28 20 29 22 13 25 1 31 1 17 9 14 6 7 19 19 11 3
C(27)	11	LB(27)	27 21 16 9 7 1 32 18 20 4 8 2 7 27 6 15 9 3 32 8 22 16 24 4 22 3 23 26 11 12 5 30
C(28)	22	LB(28)	28 19 13 12 7 2 26 29 14 19 14 20 4 21 31 26 21 14 28 6 1 10 28 10 29 13 17 3 5 30 25
C(29)	7	LB(29)	29 22 17 13 9 5 1 24 30 26 9 18 14 10 6 2 15 11 27 23 19 15 23 18 3 8 32 28 24 20
C(30)	14	LB(30)	30 27 25 21 22 19 16 13 10 7 4 1 22 32 29 26 23 20 16 31 11 8 5 2 11 7 30 27 24 21 18 15
C(31)	29	LB(31)	31 28 25 27 23 21 19 17 15 13 11 9 7 5 3 1 17 14 32 30 28 26 24 22 20 18 16 14 12 10
C(32)	32	LB(32)	32 31 29 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5

permutation pattern of basic random sequence

Basic Random sequence

10/520061

8/10

FIG. 14

q	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
$L_q(1)$	10	16	24	25	28	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9
$L_q(2)$	16	24	25	28	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9	
$L_q(3)$	24	25	28	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9		
$L_q(4)$	25	28	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9			
$L_q(5)$	28	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9				
$L_q(6)$	23	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9					
$L_q(7)$	5	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9						
$L_q(8)$	8	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9							
$L_q(9)$	12	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9								
$L_q(10)$	31	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9									
$L_q(11)$	14	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9										
$L_q(12)$	30	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9											
$L_q(13)$	21	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9												
$L_q(14)$	4	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9													
$L_q(15)$	6	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9														
$L_q(16)$	17	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9															
$L_q(17)$	7	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9																
$L_q(18)$	15	29	2	3	27	22	26	18	1	20	32	11	13	19	9																	
$L_q(19)$	29	2	3	27	22	26	18	1	20	32	11	13	19	9																		
$L_q(20)$	2	3	27	22	26	18	1	20	32	11	13	19	9																			
$L_q(21)$	3	27	22	26	18	1	20	32	11	13	19	9																				
$L_q(22)$	27	22	26	18	1	20	32	11	13	19	9																					
$L_q(23)$	22	18	1	20	32	11	13	19	9																							
$L_q(24)$	26	18	1	20	32	11	13	19	9																							
$L_q(25)$	18	1	20	32	11	13	19	9																								
$L_q(26)$	1	20	32	11	13	19	9																									
$L_q(27)$	20	32	11	13	19	9																										
$L_q(28)$	32	11	13	19	9																											
$L_q(29)$	11	13	19	9																												
$L_q(30)$	13	19	9																													
$L_q(31)$	19	9																														
$L_q(32)$	9	10																														

FIG.15

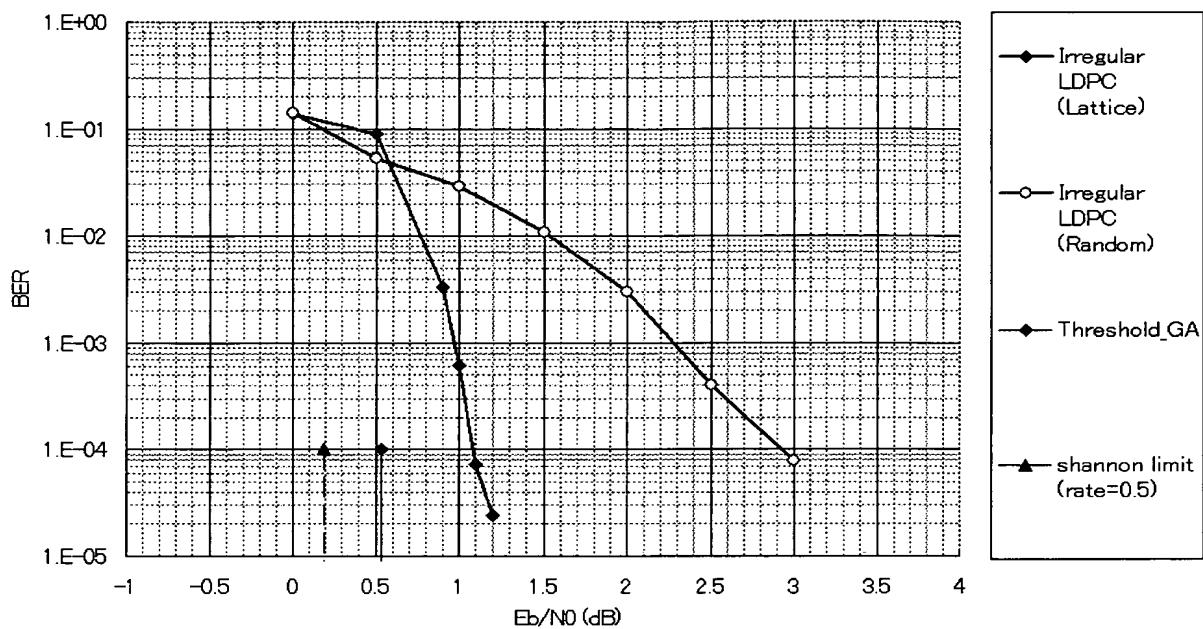
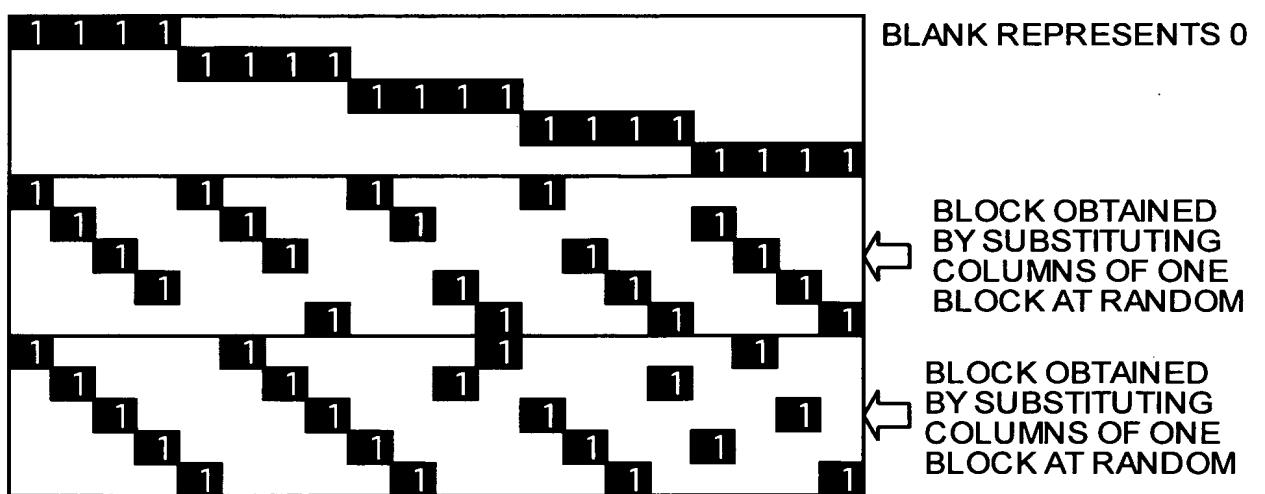


FIG.16



10/520061

10/10

FIG. 17

	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}	C_{11}	C_{12}	C_{13}	C_{14}	C_{15}
R_1	1	1		1					1						
R_2			1	1		1					1				
R_3				1	1		1					1			
R_4					1	1		1					1		
R_5						1	1		1					1	
R_6							1	1		1					1
R_7								1	1		1				1
R_8									1	1		1			
R_9	1									1	1		1		
R_{10}		1									1	1		1	
R_{11}			1									1	1		1
R_{12}				1									1	1	
R_{13}	1				1									1	1
R_{14}			1					1						1	1
R_{15}	1			1					1						1

FIG. 18

